GENETICS, PH.D.

Graduate training in genetics emphasizes study and research leading to a Ph.D. degree in genetics.

The goal of the genetics graduate training program is to train the next generation of professional geneticists. This includes selecting the most promising university graduates for admission to the program and training those students in the methods and logic of genetic analysis. Such analyses are increasingly important in contemporary biological and biomedical research. The curriculum includes:

1. coursework on the principles of genetics and on the methods of genetic and genomic analyses, and
2. original research in a specialized area, which culminates in the writing and defense of a doctoral thesis.

The genetics graduate program is supported by the oldest and one of the largest NIH-funded genetics training grants in the country.

The strength of genetics research at Wisconsin derives in large part from the Laboratory of Genetics, but state-of-the-art genetics research is conducted in many campus departments and centers. Training faculty of the genetics Ph.D. program includes over 80 trainers selected from 22 campus departments and schools based on the strength of their scholarly genetics research. A key feature of the trainers is that they conduct genetic research, using any number of tools, and can therefore provide students with a solid foundation of genetic knowledge and experiences. The genetics research pursued on campus provides an exceptional community.

Genetics Ph.D. students choose one of the training faculty as the graduate thesis advisor and mentor. Genetics graduate students spend time during the first semester of graduate school rotating in the laboratories of three or four faculty trainers, selected by the student. Following rotations, a graduate thesis advisor is chosen by mutual consent of both student and professor. Students are expected to acquire a broad and fundamental knowledge of genetics during their coursework, after which they conduct independent scholarly research based on individual interests and under the guidance and mentoring of the thesis advisor. Formal coursework requirements are modest, and independent study that includes original research is of paramount importance in the program. Students choose an individualized thesis advisory committee of five faculty members (including the thesis advisor) that approves formal coursework and provides scientific and career development advice throughout a student's graduate career.

LABORATORY OF GENETICS

The Laboratory of Genetics is the oldest and one of the finest centers of genetics in the nation. It is highly regarded for its research contributions in the areas of disease genetics (https://genetics.wisc.edu/disease-biology), cell biology (https://genetics.wisc.edu/cell-biology), neurogenetics (https://genetics.wisc.edu/neuro-and-behavioral-genetics), developmental genetics (https://genetics.wisc.edu/development), gene expression (https://genetics.wisc.edu/gene-expression), genomics (https://genetics.wisc.edu/genomics-and-proteomics), evolutionary and population genetics (https://genetics.wisc.edu/evolutionary-and-population-genetics), and computational biology (https://genetics.wisc.edu/computational-systems-and-synthetic-biology). The laboratory consists of two departments: Genetics, in the College of Agricultural and Life Sciences; and Medical Genetics, in the School of Medicine. Although administratively distinct, these two departments function as one at both the faculty and student levels.

ADMISSIONS

Ph.D. students in genetics choose to attend Wisconsin because of their commitment to the discipline of genetics and because of Wisconsin’s strength in that area. For admission to graduate study in genetics, the student should have earned a grade average of B or better and completed a B.S. or B.A. degree in a recognized college or university. There are no specific requirements in supporting fields, but students are encouraged to acquire adequate background in mathematics, physics, and biology. There is no formal language requirement for the Ph.D. in genetics. Undergraduate research experience is also strongly recommended in order to be competitive.

Admission to the genetics Ph.D. program is highly competitive. A committee of the Laboratory of Genetics reviews applications each fall, invites meritorious applicants for personal interviews each January and February, and accepts approximately 15 percent of total applications received. An application for admission consists of:

1. a resume,
2. a personal statement that discusses the reasons for pursuing a genetics Ph.D.,
3. an transcript of undergraduate college or university coursework,
4. three or more letters of recommendation,
5. a report from the Educational Testing Service of scores received on the required GRE General Test and on a recommended but not required Subject Test in Biology or Biochemistry,
6. a report, if appropriate, of scores received on either the TOEFL or IELTS exams of English language proficiency, and
7. any other information or documentation that would help the admissions committee evaluate an applicant's potential for success in graduate study.

The application deadline is December 1.

GRADUATE SCHOOL ADMISSIONS

Graduate admissions is a two-step process between academic degree programs and the Graduate School. Applicants must meet requirements of both the program(s) and the Graduate School. Once you have researched the graduate program(s) you are interested in, apply online (https://grad.wisc.edu/admissions).

FUNDING

GRADUATE SCHOOL RESOURCES

Resources to help you afford graduate study might include assistantships, fellowships, traineeships, and financial aid. Further funding information (https://grad.wisc.edu/funding) is available from the Graduate School. Be sure to check with your program for individual policies and processes related to funding.
PROGRAM RESOURCES

The Genetics Training Program is supported by an NIH Training Grant. Domestic students receive 1–2 years of funding, typically their first year and second or third year. We encourage students to apply for fellowships. Other funding sources include professors research grants and university fellowships. Funding includes a stipend, health care benefits, and tuition costs. Students must be making satisfactory progress towards their degree.

Prospective students should see the program website (https://genetics.wisc.edu/prospective-ph-d-students) for funding information.

REQUIREMENTS

MINIMUM GRADUATE SCHOOL REQUIREMENTS

Review the Graduate School minimum academic progress and degree requirements (http://guide.wisc.edu/graduate/#policiesandrequirementstext), in addition to the program requirements listed below.

MAJOR REQUIREMENTS

MODE OF INSTRUCTION

<table>
<thead>
<tr>
<th>Face to Face</th>
<th>Evening/Weekend</th>
<th>Online</th>
<th>Hybrid</th>
<th>Accelerated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Mode of Instruction Definitions

- **Evening/Weekend**: These programs are offered in an evening and/or weekend format to accommodate working schedules. Enjoy the advantages of on-campus courses and personal connections, while keeping your day job. For more information about the meeting schedule of a specific program, contact the program.
- **Online**: These programs are offered primarily online. Many available online programs can be completed almost entirely online with all online programs offering at least 50 percent of the program work online. Some online programs have an on-campus component that is often designed to accommodate working schedules. Take advantage of the convenience of online learning while participating in a rich, interactive learning environment. For more information about the online nature of a specific program, contact the program.
- **Hybrid**: These programs have innovative curricula that combine on-campus and online formats. Most hybrid programs are completed on-campus with a partial or completely online semester. For more information about the hybrid schedule of a specific program, contact the program.
- **Accelerated**: These on-campus programs are offered in an accelerated format that allows you to complete your program in a condensed time-frame. Enjoy the advantages of on-campus courses with minimal disruption to your career. For more information about the accelerated nature of a specific program, contact the program.

CURRICULAR REQUIREMENTS

Minimum Credit Requirement

<table>
<thead>
<tr>
<th>Minimum Residence Credit Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 credits</td>
</tr>
<tr>
<td>32 credits</td>
</tr>
</tbody>
</table>

Minimum Graduate Coursework Requirement

Half of degree coursework (26 credits out of 51 total credits) must be completed graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university’s Course Guide.

Overall Graduate GPA Requirement

3.00 GPA required.

Other Grade Requirements

- The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

Assessments and Examinations

At the end of their coursework, student’s complete Preliminary A, a written examination. The purpose of the Preliminary A Examination is to evaluate the student’s general knowledge in genetics, their competency in critically analyzing original genetic literature and their ability to formulate experimental solutions to genetic problems. Doctoral students are required to take a comprehensive preliminary/oral examination after they have cleared their record of all Incomplete and Progress grades (other than research and thesis). This Preliminary B Examination should be completed by December 15 of the student’s 3rd year.

Deposit of the doctoral dissertation in the Graduate School is required.

REQUIRED COURSES

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENETICS 701</td>
<td>Advanced Genetics</td>
<td>3</td>
</tr>
<tr>
<td>GENETICS 702</td>
<td>Advanced Genetics II</td>
<td>3</td>
</tr>
<tr>
<td>GENETICS/MD GENET 707</td>
<td>Genetics of Development</td>
<td>3</td>
</tr>
<tr>
<td>GENETICS/MD GENET 708</td>
<td>Methods and Logic in Genetic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ONCOLOGY 715</td>
<td>Ethics in Science</td>
<td>1</td>
</tr>
<tr>
<td>Elective: Any graduate level Genetics course (including special topics)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Four seminars

Specialized elective coursework at the discretion of your thesis committee

Students wishing to take a course outside of Genetics course offerings may petition the Graduate Program Committee.

1 GENETICS/MD GENET 707 Genetics of Development and GENETICS/MD GENET 708 Methods and Logic in Genetic Analysis are taken by the first and second years together; GENETICS/MD GENET 707 is offered one year and GENETICS/MD GENET 708 the next.

2 Permission must be obtained to register from the cancer biology department.

3 Students wishing to take a course outside of Genetics course offerings may petition the Graduate Program Committee.
GRADUATE SCHOOL POLICIES

The Graduate School’s Academic Policies and Procedures (https://grad.wisc.edu/acadpolicy) provide essential information regarding general university policies. Program authority to set degree policies beyond the minimum required by the Graduate School lies with the degree program faculty. Policies set by the academic degree program can be found below.

MAJOR-SPECIFIC POLICIES

GRADUATE PROGRAM HANDBOOK

The Graduate Program Handbook (https://genetics.wisc.edu/current-ph-d-students) is the repository for all of the program’s policies and requirements.

PRIOR COURSEWORK

Graduate Work from Other Institutions

For well-prepared advanced students, the program may accept prior graduate coursework from other institutions toward the minimum graduate degree credit and minimum graduate coursework (50%) requirement. The minimum graduate residence credit requirement can be satisfied only with courses taken as a graduate student at UW–Madison. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

UW–Madison Undergraduate

For well-prepared advanced students, the program may decide to accept up to 7 credits numbered 300 or above completed at UW–Madison toward fulfillment of minimum degree and minor credit requirements. This work would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

UW–Madison University Special

The program may decide to accept up to 15 University Special student credits as fulfillment of the minimum graduate residence, graduate degree, or minor credit requirements on occasion as an exception (on a case-by-case basis).

UW–Madison coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PROBATION

The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

ADVISOR / COMMITTEE

When students have identified a major professor and joined their lab, that professor will assume the duties of their advisor. At that time students will form a Ph.D. Advisory Committee consisting of three to five faculty members (ultimately it must be five) three of whom must be Genetics trainers, including two members of the Laboratory of Genetics faculty, and one minor advisor, if needed. One member must also be from a different department (all 5 cannot be Genetics faculty members). The Ph.D. Advisory Committee should be established no later than the end of the second semester. Under normal circumstances, the committee membership will remain in effect for the entire tenure of the student’s graduate career.

The Ph.D. Advisory Committee will advise the student with regard to major and minor requirements. It will also act as their Prelim B Examination Committee and as the Final Oral Ph.D. Examination Committee. After the advisor, this committee is the primary monitoring instrument to assure satisfactory progress toward degree. The Ph.D. Advisory Committee will meet with the student at least once per year. During these annual meetings anticipated timelines for progress of the thesis project will be discussed and concrete guidance will be given about completing the thesis. The student will complete an annual committee meeting form each year during the meeting. The annual meeting will address the assessment of the student’s progress and outline any suggestions or recommendations, in addition to verifying the discussion of the student’s Individualized Development Plan (https://grad.wisc.edu/pd/idp).

CREDITS PER TERM ALLOWED

15 credits

TIME CONSTRAINTS

Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may be required to take another preliminary examination and to be admitted to candidacy a second time.

OTHER

n/a

PROFESSIONAL DEVELOPMENT

GRADUATE SCHOOL RESOURCES

Take advantage of the Graduate School’s professional development resources (https://grad.wisc.edu/pd) to build skills, thrive academically, and launch your career.
LEARNING OUTCOMES

1. Demonstrate a broad understanding in the principles of genetics and heredity in all organisms. They will develop particular expertise in at least one of the broad subject areas of the doctoral program.

2. Demonstrate a broad understanding of major current and past theories, research findings and methodologies and techniques in genetics, with particular expertise in their area of concentration, both orally and in writing.

3. Develop critical thinking skills. They will retrieve and examine scientific literature, evaluate evidence for and against hypotheses, identify knowledge gaps, strengths and weaknesses in existing literature, synthesize knowledge, develop conclusions, and formulate plans for moving the current state of knowledge forward.

4. Develop and complete original research that advances a specific field of study within one of the broad areas subject areas in genetics.

5. Retrieve, evaluate and interpret professional peer-reviewed literature and use this information to develop theoretical frameworks, testable hypotheses, and predictions for their own research projects.

6. Design research projects that are feasible, based on well-designed and internally controlled experiments, and address important unsolved problems in genetic or biomedical research.

7. Conduct independent research, critically evaluate and interpret the resulting data, and, based on that analysis, design future experiments that advance the state of the field.

8. Write, edit, and assemble manuscripts resulting from their independent research and submit these for publication in peer-reviewed professional journals.

9. Communicate effectively to diverse audiences in writing, through oral presentations, and during formal and informal discussions.

10. Write clear and concise research articles for publication in professional journals.

11. Present at scientific conferences and in both formal and informal seminars.

12. Master methods of communicating and interacting effectively with professional colleagues, and will prepare successful applications for research grant support.

13. Articulate their research and its significance both formally and informally to diverse audiences.

14. Give and receive feedback on communication skills both orally and in writing.

15. Be provided with opportunities to engage in public outreach and education.

16. Effectively teach the principles of genetics and the methods used in contemporary genetic research.

17. Receive in-class educational training by serving as teaching assistants for at least one semester of an undergraduate genetics course.

18. Be provided with opportunities to mentor other students (for example, undergraduate students) in a laboratory research setting. Interested students will have opportunities to perform outreach activities in which they educate school-age students or individuals from other fields on the principles of modern genetics.

19. Be provided with diverse training that will prepare them for a range of flexible and sustainable careers in, for example, academia, industry, government, science policy, administration, commerce, journalism, law, education and community outreach.

20. Develop broadly applicable skills in critical thinking and problem solving.

21. Be provided with opportunities for teamwork, written and oral communication skills and collaborations.

22. Receive training in professional ethics and the responsible conduct of science.

23. Be trained to use scientific rigor when designing experiments, collecting and analyzing data, and interpreting and reporting results.

24. Discuss and formulate opinions on the many situations that working scientists encounter involving professional ethics and conflicts of interest.

25. Receive training in laws, regulation, permits and licenses, occupational health, safety standards and best practices, will demonstrate understanding of such and adhere to compliance.

PEOPLE

PROFESSORS
Doebley, John (chair); Engels, Bill; Gasch, Audrey; Ikeda, Aki; Laughon, Al; Masson, Patrick; Payseur, Bret; Peregri, Francisco; Perna, Nicole; Prolla, Tom; Schwartz, David; Skop, Ahna; Wassarman, David; Yin, Jerry

ASSOCIATE PROFESSORS
Chang, Qiang; Hittinger, Chris; Pool, John

ASSISTANT PROFESSORS
Loewe, Laurence; Zhong, Xuehua

STUDENT SERVICES
Reck, Martha